

GALENSKY 5-2

UNITED STATES PATENT APPLICATION

FOR

WIRELESS MULTIMEDIA PLAYER

ON BEHALF OF

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09366351.080299

TITLE OF THE INVENTION**WIRELESS MULTIMEDIA PLAYER****BACKGROUND OF THE INVENTION****1. Field of the Invention**

The present invention relates generally to the field of multimedia communications and, more particularly, to a method and device for streaming and/or storing high quality, real time multimedia information over a wireless telecommunications network.

2. Description of the Related Art

In recent years, the availability of multimedia information (*e.g.*, audio, video, data, *etc.*) to consumers has grown tremendously. Currently, with the popularity of the Internet, high quality, digital multimedia information can readily be obtained by a user of a personal computer hard wired to a multimedia server over the Internet.

One common example is the transmission and downloading of digital audio data files (*e.g.*, music) from a multimedia server connected to a user's computer over the Internet. The user is able to select desired audio files from a list of such files stored in or otherwise accessible by the multimedia server. To ensure high quality and minimal degradation of the original audio source, such digital audio files are typically encoded and compressed in a file format, such as MPEG, audio layer 3 ("MP3"). Software stored on the user's computer (*e.g.*, MP3 player) enables the user to play such downloaded digital audio data files by opening, decoding and decompressing the

1 audio file at the user's computer.

2 In addition to downloading and storing such digital audio files to a
3 user's computer over the Internet, it is also known to stream the audio data file to the
4 user's computer from the multimedia server over the Internet without otherwise
5 downloading or permanently storing the audio file in the user's computer. Streaming
6 of the audio data file allows the user to decode, decompress and play the audio file
7 almost immediately without waiting for the complete audio data file to first be
8 downloaded to the user's computer.

9 In today's increasingly mobile society, it is desirable for a user to
10 access and play high quality multimedia files using a portable device that can be
11 carried by the user. Existing portable devices play MP3 audio data files that have
12 previously been downloaded to the user's computer and then downloaded from the
13 computer to the portable device over a cable connection (e.g., through a serial port on
14 the computer). These existing devices utilize the user's computer as an intermediate
15 connection between the portable device and the multimedia server to ultimately store
16 MP3 audio files on the portable device. A disadvantage of such existing devices is
17 that the user must select the particular audio files to be downloaded to the portable
18 device, and arrange to download and store such files in the device prior to using the
19 portable device. Furthermore, while advances have been made on the available
20 memory in such portable devices, the number of audio files that can be downloaded
21 and stored in the portable device continue to be limited by the memory associated with
22 the device.

1 It would be advantageous to have a portable device capable of playing
2 multimedia files, such as high quality, digital audio files, in real time without first
3 having to download the preselected files from the user's computer for ultimate transfer
4 and storage in the portable device prior to playing. It would also be advantageous for
5 the user to access such files in the multimedia server without using the user's computer
6 as an intermediate connection to the multimedia server. To avoid the entertainment
7 industry's concerns over unauthorized reproduction of such copyrighted multimedia
8 files, it would be desirable for the portable device to be capable of playing the
9 multimedia file without storing the multimedia file in the device's memory for
10 subsequent use.

11 SUMMARY OF THE INVENTION

12 The foregoing and other objects and advantages are achieved in
13 accordance with the present invention through the provision of a portable device that
14 receives and plays streamed multimedia files over a wireless network from a
15 multimedia server.

16 In accordance with the present invention, a system, method and
17 wireless device are provided for receiving and playing multimedia files streamed from
18 a multimedia server over a wireless telecommunications network. A desired
19 multimedia file is selected from one or more multimedia files stored in the multimedia
20 server, which server is operatively connected to the wireless telecommunications
21 network. Successive blocks of data from the desired multimedia file are streamed over
22 the wireless telecommunications network in a digitized and compressed format and

1 received by the wireless telecommunications device. The received blocks of data from
2 the streamed multimedia file are temporarily stored in a buffer in the wireless device,
3 decoded and decompressed, and successively played through an audio and/or video
4 output in the wireless device.

5 In accordance with a preferred aspect of the present invention, the
6 wireless device receives the blocks of data over the wireless telecommunications
7 network at a first transmission rate until a minimum threshold level of data is stored in
8 the buffer and at a second transmission rate after the minimum threshold level of data
9 is stored in the buffer, the first transmission rate being higher than the second
10 transmission rate when at least the minimum threshold level of data is stored in the
11 buffer. A microprocessor in the wireless device monitors the size of the buffer to
12 ensure that the data contained in the buffer does not fall below the minimum threshold
13 level prior to receiving all of the blocks of data associated with the streamed
14 multimedia file. If the size of the buffer falls beneath the minimum threshold level,
15 the microprocessor signals the wireless telecommunications network to increase the
16 rate that data is transmitted to the device over the wireless telecommunications
17 network until the data contained in the buffer reaches or exceeds the minimum
18 threshold level.

19 In a preferred embodiment of the invention, the user of the device may
20 be billed for the use of the multimedia file prior to streaming the multimedia file to the
21 wireless device. In another preferred embodiment, an authentication code is required
22 to play multimedia files stored in a local memory of the wireless device, which code is

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1 transmitted to the wireless device upon receipt of payment information from the user
2 of the device.

3 The foregoing specific objects and advantages of the invention are
4 illustrative of those that can be achieved by the present invention and are not intended
5 to be exhaustive or limiting of the possible advantages which can be realized. Thus,
6 these and other objects and advantages of this invention will be apparent from the
7 description herein or can be learned from practicing this invention, both as embodied
8 herein or as modified in view of any variations which may be apparent to those skilled
9 in the art. Accordingly, the present invention resides in the novel parts, constructions,
10 arrangements, combinations and improvements herein shown and described.

11 **BRIEF DESCRIPTION OF THE DRAWINGS**

12 The foregoing features and other aspects of the invention are explained
13 in the following description taken in connection with the accompanying drawings
14 wherein:

15 FIG. 1 is a block diagram of a wireless multimedia communications
16 system in accordance with the present invention; and

17 FIG. 2 is a block diagram of a portable device for receiving and playing
18 multimedia files over a wireless network in accordance with the present invention.

19 **DETAILED DESCRIPTION**

20 The present invention provides a system, method and portable, wireless
21 device for receiving, playing and storing streamed multimedia files over a wireless

1 telecommunications network from a multimedia server. A preferred embodiment of
2 the present invention is described below with reference to the drawings.

3 FIG. 1 is a block diagram illustrating a preferred wireless multimedia
4 communications system in accordance with the present invention. A multimedia
5 server 10 is connected to a telecommunications network 40 via communications link
6 20. High quality, digital multimedia files (*e.g.*, audio, video, data, *etc.*) are stored
7 within or otherwise accessible to the multimedia server 10. Preferably, the multimedia
8 files are stored within the server 10 in an encoded and compressed file format, such as
9 MP3. The multimedia server 20 may be a conventional third party server accessible
10 over the Internet or a dedicated server maintained by the network provider.

11 While only one server 10 is illustrated in FIG. 1, it is understood that
12 more than one multimedia server 10 may be utilized in accordance with the present
13 invention. For instance, several multimedia servers 10 may be either linked to one
14 another or otherwise connected to the telecommunications network 40 via one or more
15 communications links 20.

16 The telecommunications network 40 may be a known wireless
17 communications network or a combination of a wireless network interconnected with a
18 conventional land-based telecommunications network, such as the Public Switched
19 Telephone Network ("PSTN"). The wireless network is preferably a high bandwidth
20 network capable of operating at speeds in excess of 144 kbps, such as a wideband
21 Code Division Multiple Access ("CDMA") platform. Other known wireless
22 platforms, such as the Universal Mobile Telecommunications System ("UMTS"),

1 Local Multipoint Distribution System ("LMDS"), Global Systems for Mobile
2 ("GSM") and even satellite-based systems (*e.g.*, the Teledesic network), may be
3 utilized as the wireless network in accordance with the present invention.

4 A portable wireless multimedia device 80, capable of decoding
5 streamed, compressed data for playback to the user in real time, is connected to the
6 network 40 over a wireless channel 60. As will be discussed below, the user of the
7 wireless device 80 is able to access the multimedia server 10 over the network 40 to
8 select one or more desired multimedia files stored or otherwise accessible to the server
9 10. The selected multimedia files are streamed to the wireless device 80 over link 20
10 through the network 40 and to the wireless device 80 over wireless channel 60. The
11 streamed multimedia files are decoded, decompressed and played by the wireless
12 device 80.

13 A preferred embodiment of the wireless device 80 is illustrated in FIG.
14 2. The wireless device 80 includes a microprocessor or microcontroller 82 for
15 controlling the operation of the wireless device 80.

16 The wireless device 80 also includes an antenna 96 and a transceiver 94
17 for transmitting or receiving information over wireless channel 60. The antenna 96 is
18 connected to the transceiver 94 to facilitate transmission or reception of
19 information/data over the wireless channel 60. Preferably, a conventional wideband
20 transceiver and antenna are used in the wireless device 80. The transceiver 94 is
21 connected to the microprocessor 82.

22 A battery 98, such as a conventional lightweight lithium-ion

1 rechargeable battery, provides power to the wireless device 80. Preferably, the battery
2 98 is electrically connected to each of the various components of the wireless device
3 80 that require power, either directly or via the microprocessor 82. The
4 microprocessor 82 may be configured to regulate the power consumption of the
5 various components of the device 80.

6 The wireless device 80 also includes a data storage memory 90 and a
7 non-volatile memory 92, each of which is connected to the microprocessor 82. The
8 data storage memory 90 is the buffer used for streaming and/or the flash memory for
9 storing the multimedia files in the wireless device 80. Multimedia files stored in the
10 data storage memory 90 may be erased or recorded over. A conventional 8 Mbyte
11 flash memory is suitable for use as the data storage memory 90. However, if the
12 multimedia file is only being streamed and not stored in the device 80, then
13 conventional 1, 2 or 4 Mbyte flash memory chips may be used as a buffer for
14 streaming of multimedia files to the wireless device 80.

15 The non-volatile memory 92 serves as the ROM for the wireless device
16 80, permanently storing programmed information (e.g., software for decoding and
17 decompressing the multimedia file) and data for running the microprocessor 82.

18 The wireless device 80 also includes a visual display 84, controls 86
19 and an audio output 88, each of which are connected to the microprocessor 82. The
20 visual display 84 is used to display information to the user of the wireless device 80,
21 such as playing a streamed video data file, displaying selections, operating the device
22 80, and providing feedback to the user regarding battery life and connection to the

1 network 40. The display 84 may be a conventional LCD, touch display or LED
2 display.

3 The controls 86 allow the user to operate the wireless device 80 and
4 interface with the microprocessor 82. Various input controls (*e.g.*, buttons, dials, soft
5 keys, jog shuttles, *etc.*) may be used to allow the user to turn power to the device 80 on
6 or off, to select desired multimedia files for streaming and/or downloading, to select
7 user preferences for the device 80, or to scroll through different options.

8 The audio output 88 allows the user of the wireless device 80 to listen
9 to a streamed or downloaded audio data file through one or more audio speakers (not
10 shown) that may be incorporated into the wireless device 80 or otherwise connected
11 through a conventional audio jack (*e.g.*, headphones).

12 In operation, the user turns the power on to the wireless device 80 by
13 selecting the appropriate input control 86. By selecting the appropriate input control
14 86, the user may view different songs, artists, genres, file names, *etc.* through the
15 visual display 84. The user may also view a list of previous files (*e.g.*, songs) and/or
16 links that were previously accessed and stored in the data storage memory 90 of the
17 device 80. Upon making a selection via the appropriate input control 86 and visual
18 display 84, the user may access and listen to and/or view the selected multimedia file
19 previously stored in the data storage memory 90 without establishing a connection to
20 the network 40 over wireless channel 60.

21 In addition, upon making a selection via the appropriate input control
22 86 and visual display 84, the user may alternatively establish a connection to the

1 appropriate, desired multimedia server 10 via the wireless channel 60, the network 40
2 and link 20. Alternatively, the user of the wireless device 80 may select an appropriate
3 input control 86 on the device to establish a connection to a prime multimedia server
4 10 via the wireless channel 60, the network 40 and link 20, which prime media server
5 10 either stores multimedia files or a list of particular multimedia files and their
6 respective address/location.

7 To connect the wireless device 80 to the multimedia server 10, the
8 microprocessor 82 instructs the transceiver 94 to make a connection over the wireless
9 network 40 to the multimedia server 10. As discussed above with respect to FIG. 1,
10 this connection may be made using solely a wireless telecommunications network or a
11 combination of a wireless telecommunications network with the PSTN, Internet and/or
12 similar type of wired telecommunications network.

13 Once connected to the multimedia server 10, the user of the wireless
14 device 80 may view a list of multimedia files (*e.g.*, audio, video, data, *etc.*) or general
15 categories of such multimedia files (*e.g.*, by artist, genre, *etc.*) on the visual display 84
16 of the device 80, which list was communicated to the device 80 by the multimedia
17 server 10 over link 20, network 40 and wireless channel 60. Preferably, the list was
18 communicated by the server 10 to the network 40 in a TCP/IP packet format, which
19 list would then be reformatted for transmission over the wireless network in a
20 conventional manner. The reformatted list is received at the transceiver 94, processed
21 by the microprocessor 82 and displayed on the visual display 84.

22 The user of the wireless device 80 selects the desired item(s) from the

1 displayed list through use of the appropriate input control **86** and the microprocessor
2 **82** instructs the transceiver **94** to transmit the selection to the multimedia server **10**
3 over the wireless channel **60**, network **40** and link **20**.

4 Upon receipt of the desired selection, the multimedia server **10** then
5 streams the selected multimedia files (*e.g.*, digital MP3 audio files, video data files,
6 *etc.*) back to the wireless device **80** over link **20**, network **40** and wireless channel **60**.
7 The digital multimedia file is preferably transmitted in an encoded and compressed
8 format, such as MP3, to the network **40** in TCP/IP packets, which are reformatted in a
9 conventional manner for transmission over the wireless network and wireless channel
10 **60** to the wireless device **80**.

11 The wireless device **80** receives the transmitted multimedia file at the
12 transceiver **94** and transfers the multimedia file to the microprocessor **82**, which
13 creates a temporary buffer in the data storage memory **90**. The use of a buffer ensures
14 that there is a continuous transmission of data so that the multimedia file (*e.g.*, digital
15 MP3 audio file) sounds of high quality. Once an acceptable buffer is created, the
16 microprocessor **82** converts the data temporarily stored in the buffer to a voltage signal
17 suitable for audio/video output and sends that converted data from the buffer to the
18 audio output **88** (for audio data files) and/or video display **84** (for video data files) for
19 listening/viewing playback to the user of the wireless device **80**.

20 In addition to streaming the multimedia file to the wireless device **80**
21 from the multimedia server **10**, the user may store the file in the data storage memory
22 **90** (flash memory) of the device **80** for playback at a later time from a list of stored

1 files displayed on the visual display 84 and selected through the use of the appropriate
2 input controls 86.

3 To allow the wireless network provider to serve more subscribers and
4 allow more users to access the system in accordance with the present invention, it is
5 advantageous to conserve bandwidth within the wireless network 40. One way of
6 accomplishing this is to preferably transmit data at the highest data rate possible over
7 the wireless network 40 at the point in time when the data stream is initiated (*e.g.*, the
8 maximum bandwidth that the wireless network 40 can afford to allocate to a user and
9 the maximum bandwidth the wireless device 80 can accept) to permit the
10 microprocessor 82 of the device 80 to create approximately 5 – 10 seconds of buffer
11 (which may take approximately 1 second). Once an acceptable buffer is created (*e.g.*,
12 approximately 5 – 10 seconds of buffer), the microprocessor 82 will instruct the
13 transceiver 94 to signal the wireless network 40 to decrease the data transmission rate
14 to the minimum rate necessary for adequate transmission—that is, fast enough so that
15 the buffer does not fall below a minimum threshold level (*e.g.*, 2 – 3 seconds of audio)
16 and empty before receiving subsequent streamed data. If the buffer falls beneath this
17 minimum threshold level, then the microprocessor 82 will instruct the transceiver 94 to
18 signal the wireless network 40 to increase the data transmission rate until the minimum
19 threshold level is satisfied, at which point in time the microprocessor 82 will then
20 instruct the transceiver 94 to signal the wireless network 40 to decrease the data
21 transmission rate to the maintain the minimum threshold level in the buffer until all the
22 data is transmitted and the multimedia file (*e.g.*, digital MP3 audio file) has ended.

1 It is understood that a Mobile Identification Number ("MIN") may be
2 used to identify and locate the wireless device 80 within the wireless network 40. As
3 discussed above, information may preferably be communicated over link 20 from the
4 multimedia server 10 to the wireless network 40 in TCP/IP formatted packets
5 addressed to the MIN assigned to the wireless device 80. The wireless network 40
6 preferably reformats the packets sent by the server 10 into an appropriate format for
7 the wireless network 40. Because the wireless device 80 registers with the wireless
8 network 40 in a conventional manner, the wireless network 40 identifies the
9 approximate location of the wireless device 80 and transmits the reformatted data to
10 the base station (not shown) within the wireless network 40 where the device 80 is
11 currently registered. The reformatted data is then transmitted from the base station to
12 the device 80 over wireless channel 60.

13 The present invention is particularly well-suited to address and alleviate
14 the entertainment industry's concern over unauthorized copying, reproduction or
15 distribution of copyrighted works contained in the multimedia files. To avoid this
16 concern, the preferred embodiment of the present invention provides the ability to
17 stream the multimedia file from the multimedia server 10 to the wireless device 80
18 over network 40 for temporary storage in a buffer in the data storage memory 90 of the
19 device 80. In this manner, the streamed multimedia file may be played once in real
20 time on the wireless device 80, rather than requiring the multimedia file to be stored in
21 the device 80 for subsequent use. The user of the device 80 may be billed for each
22 time the multimedia file is streamed to the device 80.

1 In a preferred embodiment of the invention, the user of the wireless
2 device 80 may be billed prior to transmitting the multimedia file to the device. To
3 start, a connection to a multimedia server 10 is established over the network 40 in a
4 manner as discussed above. Then, a desired multimedia file is selected for listening
5 and/or viewing by the user of the wireless device 80, also in a manner as discussed
6 above. Next, a secure financial transaction is conducted by first determining the user's
7 account (*i.e.*, a cellular phone bill, credit card account, *etc.*), then debiting the account
8 a specific amount for the use of the multimedia file, and finally confirming that the
9 transaction has been approved. The specific details associated with this billing will be
10 predetermined by the service provider, likely in a manner consistent with already
11 established practices. Once the user of the wireless device 80 has been properly
12 charged, the selected multimedia file is streamed to the wireless device 80 by the
13 multimedia server 10 over the wireless network 40 in a manner as described above.

14 Alternatively, in another preferred embodiment, the multimedia server
15 10 may first transmit the multimedia file to the wireless device 80 over network 40 and
16 store the file locally in memory 90 of the device 80. An authentication code to be sent
17 by the multimedia server 10 over the wireless network 40 to the wireless device 80
18 would be required when the user desires to play the multimedia file on the device 80.
19 One benefit of this approach is that the multimedia file only needs to be transmitted
20 once for multiple playback, reducing airtime costs. Since the authentication code must
21 be used to play the multimedia file on the wireless device 80, the ability to bill the user

1 of the device 80 each time the multimedia file is played on the device 80 by the user is
2 ensured.

3 More specifically, in this preferred embodiment of the invention, the
4 user of the wireless device 80 is billed for the replay of multimedia files already
5 received and stored at the device 80. In this case, the desired multimedia file is
6 downloaded from the multimedia server 10 in a manner as discussed above and stored
7 locally in memory 90 of the device 80. Once the user of the device 80 chooses to play
8 (e.g., listen and/or view) the multimedia file, a connection is established between the
9 wireless device 80 and the multimedia server 10 over the network 40 to authenticate
10 the user and record the billing information in a manner predetermined by the provider
11 of the service. Once completed, an authentication code is transmitted by the
12 multimedia server 10 over the network 40 to the wireless device 80, which code is
13 used as a key to allow the stored multimedia file to be played on the wireless device
14 80. Without the code, the stored multimedia file is unable to be played by the wireless
15 device 80.

16 Although an illustrative preferred embodiment has been described
17 herein in detail, it should be noted and will be appreciated by those skilled in the art
18 that numerous variations may be made within the scope of this invention without
19 departing from the principle of this invention and without sacrificing its chief
20 advantages. The terms and expressions have been used herein as terms of description
21 and not terms of limitation. There is no intention to use the terms or expressions to
22 exclude any equivalents of features shown and described or portions thereof and this

1 invention should be defined in accordance with the claims that follow.

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